

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE. Assistant Editor: FRANK OWEN STETSON.

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The MONTHLY WEATHER REVIEW is based on data from about 3500 land stations and many ocean reports from vessels taking the international simultaneous observation at Greenwich noon.

Special acknowledgment is made of the data furnished by the kindness of cooperative observers, and by Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in

charge of the Jamaica Weather Office; Señor Anastasio Alfaro, Director of the National Observatory, San José, Costa Rica; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba.

As far as practicable the time of the seventy-fifth meridian, which is exactly five hours behind Greenwich time, is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e. apparent gravity at sea-level and latitude 45°.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

THE RELATION BETWEEN STORM MOVEMENT AND PRESSURE DISTRIBUTION.

By EDWARD H. BOWIE, Local Forecaster. Dated St. Louis, Mo., November 30, 1905.

The influence exerted by the pressure of contiguous regions of high pressure, or the flow of air therefrom, to modify the rate and the direction of progression of a storm center, is a principle recognized by practically all writers on the subject of weather forecasting. The first mention of such an influence is nearly coincident with the earliest use of synoptic charts in weather predicting. It is a matter of common observation that in the middle latitudes, where storms move in an easterly direction, a storm center lying near and south of an area of high pressure pursues a course that deviates to the right of the track that storms of that particular locality normally travel, and the converse is true when a storm is charted north or northwest of an area of high pressure; again, when an area of high pressure covers the region toward which the storm would move under normal conditions, then its progressive motion is retarded, but when an area of high pressure develops in the rear of a storm its movement is accelerated.

In view of the foregoing, it is seen that the influence of the pressure distribution adjacent to a storm center in causing a storm to depart from a normal course should be considered in forecasting; and it follows that the explanation of an abnormal storm movement is often to be found in the unequal pressure distribution surrounding the storm center. Assuming anomalous storm movements to be mainly due to anomalous pressure distribution, it is obvious that the direction and velocity of storm movement could be predetermined were it possible to obtain correct values of (1) the displacement of the storm center arising from the unequal pressure distribution, and (2) the value of the drift of the upper air currents that appear to carry the storm with them. In order to represent quantitatively the displacement or movement of the storm center due to unequal pressure, each tenth of an inch increase in barometric pressure, measured outwardly from the storm center along lines radiating to the north, northeast, east, etc., has after many trials been considered as equivalent to a movement of the storm center by 62.99 miles, or to a vector of 0.40 inch, or one centimeter, in length, on a map the scale

of which is about 160 miles to the inch.¹ The pressure is considered along the lines radiating northward, northeastward, etc., from the center of the storm outward to the points where the general trend of the isobars is no longer approximately perpendicular to these radii.

The general resultant of these eight vectors represents the total influence of the pressure [or some equivalent flow of air.—C. A.] toward the storm center from the surrounding regions of high pressure, and is assumed to show both the direction and the extent of the 24-hour displacement of the storm center so far as it is due to the unequal distribution of pressure. If the pressure of the air from all directions toward the storm center be a factor in determining the direction and the velocity of the movement of the center, it is apparent that this "general pressure resultant" summarizes one of the forces that determine the storm's path.

By considering the above resultant pressure effect as one of two component forces that cause the storm center to move along its path, it is possible to find the other component, or the so-called "eastward drift," by resolving an observed 24-hour movement into its two corresponding components by the parallelogram of forces.

It may be expected that the second component, or drift, should have approximately the same direction and value for two or more storms in the same locality for any given month of the year, and in fact the values when charted for each locality show an agreement that can not be wholly the result of accident.

¹This is very nearly the scale of the Washington morning weather map (Form C), or the outline forecast map (Form A), or the Form A-C, which was prepared some years ago for special study by adding the contour lines for each 1000 feet for Canada, United States, and Mexico. The engraving from which these maps are printed represents a polyconic projection in which the linear dimensions are 1/10,000,000 of corresponding distances on the earth's surface. That is to say, the distance from the pole to the equator is represented by one meter, and the length of a degree of a great circle by 11.111 millimeters, or 0.44 inch. Adopting the dimensions of the Clarke spheroid of 1866, as in the Smithsonian Geographical Tables, we have for the radius of the sphere having the same surface as that spheroid 3958.8 miles; its circumference is 24873.8 miles, and its surface 196,940,400 square miles. A degree of a great circle is, therefore, 69.094 miles, which, on the scale of 1/10,000,000, becomes 0.4378 inch on the morning weather map, or at the rate of 157.8 miles to the inch; nine-tenths of a degree is 62.18 miles; 0.91 degree is 62.99 miles.

To illustrate the method of computing the pressure component, draw lines on any map outward from the center of the storm and measure the rise of pressure along each radius so long as that radius is nearly perpendicular to the isobars. We obtain the figures in the following tables from the maps of May 25, 26, 27, 28, and 29, 1903:

TABLE 1.—May 25, 1903, storm center over New Mexico.

Measured toward—	Difference in pressure.	Pressing toward—	Resolved pressure.			
			E.	W.	N.	S.
	<i>Inch.</i>		<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
n.	0.20	s.	0.00	0.00	0.00	0.20
ne.	0.20	sw.	0.00	0.14	0.00	0.14
e.	0.50	w.	0.00	0.50	0.00	0.00
se.	0.20	nw.	0.00	0.14	0.14	0.00
s.	0.00	n.	0.00	0.00	0.00	0.00
sw.	0.00	ne.	0.00	0.00	0.00	0.00
w.	0.20	e.	0.20	0.00	0.00	0.00
nw.	0.20	se.	0.14	0.00	0.00	0.14
Sum			0.34	0.78	0.14	0.48
Excess				0.44		0.34

Resultant 0.56 inch, S. 52° 18' W.

TABLE 2.—May 26, 1903, storm center over northwestern Texas.

Measured toward—	Difference in pressure.	Pressing toward—	Resolved pressure.			
			E.	W.	N.	S.
	<i>Inch.</i>		<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
n.	0.10	s.	0.00	0.00	0.00	0.10
ne.	0.00	sw.	0.00	0.00	0.00	0.00
e.	0.60	w.	0.00	0.60	0.00	0.00
se.	0.30	nw.	0.00	0.21	0.21	0.00
s.	0.30	n.	0.00	0.00	0.30	0.00
sw.	0.30	ne.	0.21	0.00	0.21	0.00
w.	0.30	e.	0.30	0.00	0.00	0.00
nw.	0.20	se.	0.14	0.00	0.00	0.14
Sum			0.65	0.81	0.72	0.24
Excess				0.16	0.48	

Resultant 0.51 inch, N. 18° 26' W.

TABLE 3.—May 27, 1903, storm center over Wisconsin.

Measured toward—	Difference in pressure.	Pressing toward—	Resolved pressure.			
			E.	W.	N.	S.
	<i>Inch.</i>		<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
n.	0.10	s.	0.00	0.00	0.00	0.10
ne.	0.10	sw.	0.00	0.07	0.00	0.07
e.	0.50	w.	0.00	0.50	0.00	0.00
se.	0.70	nw.	0.00	0.49	0.49	0.00
s.	0.40	n.	0.00	0.00	0.40	0.00
sw.	0.40	ne.	0.28	0.00	0.28	0.00
w.	0.20	e.	0.20	0.00	0.00	0.00
nw.	0.10	se.	0.07	0.00	0.00	0.07
Sum			0.55	1.06	1.17	0.24
Excess				0.51	0.93	

Resultant 1.06 inches, N. 28° 44' W.

TABLE 4.—May 28, 1903, storm center over northwestern Texas.

Measured toward—	Difference in pressure.	Pressing toward—	Resolved pressure.			
			E.	W.	N.	S.
	<i>Inch.</i>		<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
n.	0.30	s.	0.00	0.00	0.00	0.30
ne.	0.20	sw.	0.00	0.14	0.00	0.14
e.	0.60	w.	0.00	0.60	0.00	0.00
se.	0.30	nw.	0.00	0.21	0.21	0.00
s.	0.10	n.	0.00	0.00	0.10	0.00
sw.	0.10	ne.	0.07	0.00	0.07	0.00
w.	0.10	e.	0.10	0.00	0.00	0.00
nw.	0.40	se.	0.28	0.00	0.00	0.28
Sum			0.45	0.95	0.38	0.72
Excess				0.50		0.34

Resultant 0.60 inch, S. 55° 47' W.

TABLE 5.—May 29, 1903, storm center over Kansas.

Measured toward—	Difference in pressure.	Pressing toward—	Resolved pressure.			
			E.	W.	N.	S.
	<i>Inch.</i>		<i>In.</i>	<i>In.</i>	<i>In.</i>	<i>In.</i>
n.	0.60	s.	0.00	0.00	0.00	0.60
ne.	0.70	sw.	0.00	0.49	0.00	0.49
e.	0.60	w.	0.00	0.60	0.00	0.00
se.	0.30	nw.	0.00	0.21	0.21	0.00
s.	0.20	n.	0.00	0.00	0.20	0.00
sw.	0.10	ne.	0.07	0.00	0.07	0.00
w.	0.40	e.	0.40	0.00	0.00	0.00
nw.	0.40	se.	0.28	0.00	0.00	0.28
Sum			0.75	1.30	0.48	1.37
Excess				0.55		0.89

Resultant 1.05 inches, S. 31° 43' W.

Figure 1 shows the method followed to determine the direction and amount of the 24-hour drift for a given locality; the vector x represents the direction and movement in 24 hours of the storm that was centered near Amarillo, Tex., 8 a. m., May 26, 1903; the vector x_1 represents the resultant of all the pressures acting on the storm center, as determined from the increase of pressure outward from the storm center in all directions, as shown on the weather map at 8 a. m. and as given in Table 2, illustrating the method for computing the pressure component.

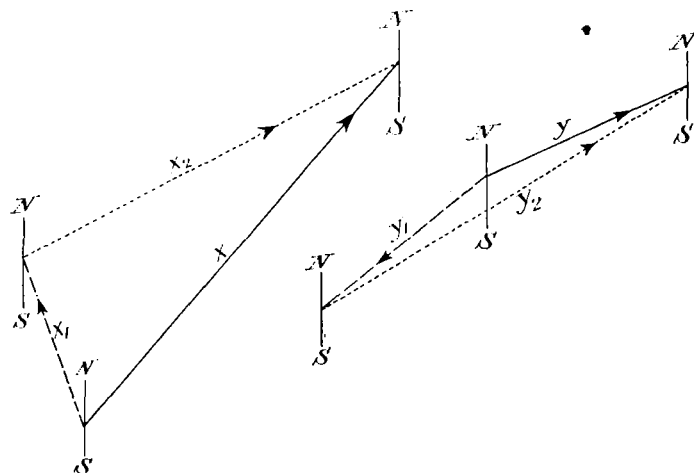


FIG. 1.

FIG. 2.

In fig. 2 we present a similar study of the path of the storm that was centered near Amarillo, Tex., 8 a. m., May 28, 1903; the vector y represents the observed or actual 24-hour path of the storm; the vector y_1 is the resultant of all the pressures exerted on the storm center determined from the measured increase of pressure, as shown in Table 4.

The resultant of x and x_1 is the drift, x_2 , or, conversely, the resultant of x_1 (the pressure) and x_2 (the drift) is x (the path). Similarly for y_1 , y_2 , and y .

Now the drift is a very general atmospheric phenomenon. The pressure components we see before our eyes, changing on every map, but the drift may be plausibly assumed to change but little for any given month and locality. Probably the average of all the observed daily paths, x , y , etc., for a series of storms will, to a large degree, eliminate the variable part of the pressure component, so that instead of going through the laborious process of resolving every storm track we might take an average that would give nearly the same result, and especially would this be the case if we took an average of only those storms for which the pressure resultants x_1 , y_1 , etc., are zero. That is to say, these storms will give us the values of x_2 , y_2 , without the labor of the resolution of each parallelogram of forces. The mean drift of storms whose pressure resultants are zero is the same as the average of the storm tracks

themselves. These have been compiled for each month and for each location as shown on the Charts, IX to XX, and are called normal storm drifts. By adopting these as the values of x_1 for any given month and place, and combining with them the values of x_1 or the pressure component for any special storm or date, we can deduce by the parallelogram of forces the value of x or a prediction of the actual path for that storm and date.

It is not possible for me to state within what limits the drifts on Charts IX to XX are correct, for the reason that their absolute values are unknown, yet I believe them to be close approximations for the several months. The Washington weather maps for 1890 to 1904, inclusive, were used in the preparation of these charts; they are not hypothetical possibilities, but were determined by resolving actual storm paths by the laborious method explained in the preceding text. It is assumed that any actual 24-hour storm track is the resultant of the effect of an eastward drift combined with the influence of the pressures acting toward the storm center. If the pressure effect be eliminated from the actual storm track, the remaining component represents the 24-hour eastward drift, and the average of many of these latter is taken as the 24-hour normal storm drift. Such averages were computed by dividing the country into 5-degree squares and grouping by months the values representing the eastward drift for all the storms that passed over the several 5-degree squares. The means thus obtained have been entered on Charts IX to XX as the normal drift for 24 hours.

Our charts of normal drifts give x_1 not only as to direction, but also as to distance, by the scale of miles on the charts, and it remains only to determine the value of x_1 on the same scale of miles before we can combine them together. This has been done by constructing a number of diagrams similar to figs. 1 and 2. In each of these diagrams the resultant pressure component, x_1 , y_1 , etc., as given in Tables 1, 2, 3, 4, 5, expressed in inches of barometric pressure, has been previously multiplied by a factor in order to convert it into miles. Each diagram similar to fig. 1, constructed with x in miles but x_1 in inches, will give a value of x_2 , varying in length and direction; whereas if a proper scale be used for x_1 the values of x_2 may be made to agree as to either length or direction, but not necessarily as to both. I have chosen to make them agree as to direction; that is to say, I have adopted the hypothesis that the normal drift is in the same direction for any given locality throughout the whole period studied by me, but may vary in intensity with the season or month. In this way I have been able to determine the factor expressing the relation between inches of resultant pressure and miles of distance in its effect on the motion of the storm. I find that this relation is fairly constant for any given locality and month. In general, each tenth of an inch of pressure has been found equivalent to a movement of about nine-tenths of a degree of a great circle, or to 62.99 miles, or 0.40 inch on the scale of the morning weather map. Thus, for instance, in December, in Colorado, a storm center is, during 24 hours, carried eastward 725 miles by the drift; and if it is also subject to a pressure that tends to force it southward 400 miles in 24 hours, then the resulting movement is 790 miles to the southeast.

Charts XXI to XXVII illustrate the use of this system in forecasting the probable direction and rate of movement of a storm center. In these charts the vector a is the 24-hour eastward drift, b the resultant of the pressures acting toward the storm center from all directions, and c the resultant of a and b , or the path that the storm center will probably follow in the succeeding 24 hours.

The following table gives the increase in pressure, measured from the storm center outward along lines radiating to the north, northeast, east, etc., that was used in computing the vectors b on Charts XXI to XXVII.

TABLE 6.

Direction.	Number of chart.							
	XXI	XXII	XXIII.*	XXIII.†	XXIV	XXV	XXVI	XXVII
North.....	0.2	0.1	0.1	0.2	0.3	0.6	0.6	0.7
Northeast.....	0.2	0.0	0.1	0.1	0.2	0.7	0.6	0.7
East.....	0.5	0.6	0.5	0.2	0.6	0.6	0.5	0.6
Southeast.....	0.2	0.3	0.7	0.1	0.3	0.3	0.3	0.2
South.....	0.0	0.3	0.4	0.0	0.1	0.2	0.2	0.3
Southwest.....	0.0	0.3	0.4	0.1	0.1	0.1	0.2	0.3
West.....	0.2	0.3	0.2	0.2	0.1	0.4	0.3	0.3
Northwest.....	0.2	0.2	0.1	0.4	0.4	0.4	0.5	0.5

* Storm center over Wisconsin. † Storm center over Utah.

From a study of storm movement by the preceding method, it is apparent that the rate and the direction of movement of a storm center in relation to its movement along the lines of drift is governed largely by the variable component representing the displacement of the storm center arising from the unequal pressure distribution at sea level; hence it follows that when the resultant pressure acts toward the left (when facing the direction of normal progression) the storm will move to the left of the normal direction of advance, and when the resultant presses to the right the storm will move to the right. When this resultant pressure is acting in conjunction with the eastward drift, the storm's rate of movement will be accelerated; and when in opposition to the eastward drift, the storm's progress will be retarded. It appears that in nearly all instances the storm increases in intensity when forced to move to the left, and loses intensity when forced to move to the right, of the normal track or drift.

Naturally exceptions are to be found in applying the method outlined above, but in practically all instances the exception has been the result of an unforeseen increase or decrease in the pressure toward the storm center from some one or more of the several directions, which, in addition to offering an explanation of the exception, tends to prove the correctness of the general principle. Of course the application of the method is limited when the storm center is near a region from which no pressure observations are available, as, for instance, with the storms that move along the Canadian border. In cases where there are a number of ill-defined storm centers it is not always possible to determine which center will become the primary one and which centers will be dissipated, and therefore there is more or less doubt whether the deductions will be borne out by subsequent events. In nearly all instances involving exceptions, the error in predetermining the movement of the storm center is apparently due to inability to determine the exact values that should be used to represent the pressure toward the storm center from the several directions; especially is this the case when the barometric changes over large areas are rapid.

It has also been noted that when the north-south temperature gradient is strong there is a tendency for the progressive motion of storms to increase, and when the isotherms are parallel to the normal drift and are congested the tendency is for the storm to follow closely the path marked out by the isotherms, despite the fact that the pressure resultant may indicate a different path.

Again, when the areas of high pressure are moving rapidly, allowance must be made for the rapidly changing pressure distribution also.

When the isobars are parallel to the Rocky Mountains, especially with a winter high over the Plateau region, the pressure outwardly from the storm center must not be considered beyond the Rocky Mountain divide.

In order to show the results of the application of this method in actual practise, the accompanying Table 7 has been compiled from the forecast maps prepared by the author during the month of January, 1903. The same data are graphi-

TABLE 7.

Date, 1903.	Location of storm center, 8 a. m.	Increase in pressure, in tenths of inches, measured outwardly from the storm center toward:								Actual movement of storm center in succeeding 24 hours.	Predicted movement of storm center in succeeding 24 hours.	Angular divergence between actual and predicted paths.
		N.	NE.	E.	SE.	S.	SW.	W.	NW.			
January 1	West Gulf	2	4	2	0	0	0	0	0	cm.†	cm.†	°
2	Southeast Arkansas	3	5	4	3	2	3	3	5	14.0	12.0	15.0
3	Lake Erie	4	6	6	5	5	6	6	5	15.5	14.0	13.0
3	Near Medicine Hat	*	*	*	*	*	*	*	*	13.0	13.0	4.0
4	Iowa	2	2	1	0	0	1	5	2	10.5	14.0	10.0
5	Southern Indiana	0	0	1	2	0	0	4	1	12.5	14.5	17.0
5	Alberta	*	*	*	*	*	*	*	*	10.5	13.0	7.0
6	Manitoba	*	*	*	*	*	*	*	*	13.5	13.5	4.0
7	Lower Michigan	10	10	6	9	11	12	12	12	17.5	21.0	10.0
9	Arizona	4	5	0	0	0	0	1	3	11.5	13.0	5.0
10	Rio Grande Valley	0	5	4	2	0	0	0	4	17.0	11.0	0.0
11	Ohio Valley	2	2	7	5	4	6	7	6	23.0	23.5	19.0
20	Lake Superior	6	6	7	9	3	4	6	6	12.5	10.0	3.0
20	Central Texas	3	2	1	1	1	1	2	4	8.5	10.0	0.0
21	New Jersey	3	6	5	5	2	3	5	6	16.0	13.5	13.0
21	North Dakota	*	*	*	*	*	*	*	*	12.0	12.5	9.0
22	Upper Michigan	*	*	*	*	*	*	*	*	14.0	12.5	7.0
23	Oklahoma	5	6	5	4	3	3	4	4	10.5	10.0	3.0
24	Kentucky	3	6	4	2	1	2	1	1	5.0	5.0	9.0
26	Northwest Texas	4	1	7	3	2	2	2	4	8.0	8.0	7.0
28	Wyoming	4	5	4	5	4	5	5	3	14.5	13.5	7.0
29	Lake Michigan	*	*	*	*	*	*	*	*	9.5	12.5	4.0
Average										12.5†	12.5†	7.95

* Normal storm track used as predicted path; impossible to get correct pressure resultant. † Expressed in centimeters as measured on the 8 a. m. maps, where 1 centimeter = 1/10 degree of a great circle, or about 62.2 English statute miles on the earth's surface, and where 0.438 inch is a degree of the great circle, or about 69.09 miles. ‡ 777.4 miles.

cally shown on Chart XXVIII. The table shows the increase in barometric pressure outward in every direction from the storm center; from the data in these eight columns the pressure resultants were determined, and thence the paths predicted by the present method. This information may be useful to any reader who cares to check the results shown by the charts.

CLIMATOLOGY OF HAITI IN THE EIGHTEENTH CENTURY.

By C. FITZHUGH TALMAN, U. S. Weather Bureau.

Foremost among the early writers upon the island of Santo Domingo, was Médéric-Louis-Elie Moreau de St. Méry, who produced three voluminous works upon the French possessions in the West Indies. Born at Fort Royal, Martinique, in 1750, he passed his early manhood in Paris, migrated thence to Haiti, and settled at the then capital of the colony, Cap Français (now Cap-Haïtien). He held an important office in the administration of the colony, and also, under a commission from Louis XVI, traveled extensively through the French West Indies, collecting material for a work which was published in 1785 under the title, "Lois et Constitutions des Colonies Françaises de l'Amérique sous le Vent, de 1550 à 1785." Returning to France, he took an active part in the French Revolution, until obliged to flee from his political enemies to the United States. It was during a period of exile in the latter country that he published two works descriptive of the island of Santo Domingo; one devoted to the Spanish part of the island, and the other to the French part.

Having recently obtained access to the latter of these works, I have, at the suggestion of the Editor of the MONTHLY WEATHER REVIEW, extracted and translated those portions relating to the climate—a subject to which the author devotes a generous share of attention. The original material is scattered through the two volumes of which the work is composed; and it is frequently so diffuse in style and so overloaded with trivial details that a certain amount of condensation was imperative; but I have not intentionally omitted anything of strictly meteorological interest and importance.

Haiti enjoys the rare distinction of having been more

¹ Moreau de St. Méry, M. L. E. Description topographique, physique, civil, politique et historique de la partie française de l'île Saint-Domingue. Philadelphie. 1797. 2 vols. This work was republished in 1875 (Paris. Morgand. 2 vols., 8°), but I have seen only the original edition. It is to this day regarded by the Haitians as the highest authority upon the physical geography of their country, and is quoted at length in the latest Haitian gazetteer (Rouzier, S. Dictionnaire géographique et administratif d'Haïti. Paris. 1899).

thoroughly studied climatologically in the eighteenth century then in the nineteenth. As a French colony Haiti reached a high state of civilization, and among its prosperous inhabitants were many assiduous cultivators of the sciences. A scientific society, the Cercle des Philadelphes, flourished in colonial days, and it is understood that a volume (Tome II) of the memoirs of this society was devoted to meteorology, but, in spite of diligent inquiry, I have not been able to obtain or locate a copy of this work. Possibly it was the source from which Moreau de St. Méry drew most of his information upon the climate of the colony.

Whereas under French rule meteorological observers were well distributed over the country and interesting local peculiarities of the climate were brought to light, since the war of independence meteorology has been almost entirely neglected except at Port au Prince. At the latter place regular observations were maintained by Ackermann from 1863 to 1868, inclusive; since 1888 they have been made by Scherer, of the Collège St. Martial. Scherer's observations are published in detail in the Jahrbücher of the Vienna Central-Anstalt; and both Ackermann's and Scherer's observations were fully discussed in the "Anhang" to the Jahrbuch for 1893, and in the Meteorologische Zeitschrift for March, 1897, pp. 116-119. Outside of Port au Prince and its environs no observations are known to have been made in Haiti during the nineteenth century, with the exception of brief series at Cap-Haïtien and Sans Souci,² about 1819, and rainfall observations at one or two of the stations recently organized by Professor Scherer.

Finally, in 1905, the Société Astronomique et Météorologique de Port au Prince was organized, having, as one of its objects, the inauguration of climatological observations throughout the country. The monthly leaflets published by this society, as well as those published by Professor Scherer, now include results from a few stations outside of the capital.

In the following translation will be found particulars regarding the climate of most of the parishes into which the French colony was divided. Although the boundary lines of the parishes are not given on the accompanying map, fig. 1, the location of each parish is indicated in a general way by that of its chief town, which usually bears the same name. In the case of the Artibonite plain and river the author has found it convenient to treat several contiguous parishes together, as they have similar physical features.

² Tippenhauer, L. G. Die Insel Haïti. Leipzig. 1893.